CITY PLANNING & ZONING COMMISSION
MEETING MINUTES
June 23, 2010

The Bismarck Planning & Zoning Commission met on June 23, 2010, at 5:00 p.m. in the Tom Baker Meeting Room in the City-County Office Building, 221 North 5th Street. Chairman Yeager presided.

Commissioners present were Mark Armstrong, Mel Bullinger, Jack Hegedus, Curt Juhala, Vernon Laning, Ken Selzler, Lisa Waldoch and Wayne Yeager.

Commissioners Jo Conmy and John Warford were absent.

Staff members present were Carl Hokenstad – Director of Community Development, Gregg Greenquist – Planner, Kim Lee –Planning Manager, Jason Tomanek – Planner, Kimberley Gaffrey– Office Assistant III, Charlie Whitman – City Attorney and Ray Ziegler – Building Official.

Others present were Frank & Patricia Kartch – 8233 Arcata Drive, Christopher Hambrick – 8200 Arcata Drive, Paul Zent – 5100 93rd Street SE, Jake Axtman – 2120 South 12th Street, Wade Felton – 503 Greenfield Lane, Anne Bry – 436 Saturn Drive, Michelle Gust – 2413 LaCorte Loop, Jeanette Johnson – 5121 Sumter Circle, Michael Gunsch – 3712 Lockport Street and Gailen Narum – 2422 LaCorte Loop.

MINUTES

Chairman Yeager called for consideration of the minutes of the May 26, 2010 meeting.

MOTION: Commissioner Armstrong made a motion to approve the minutes of the May 26, 2010 meeting as received. Commissioner Juhala seconded the motion and it was unanimously approved with Commissioners Armstrong, Bullinger, Hegedus, Juhala, Laning, Selzler, Waldoch and Yeager voting in favor of the motion.

INTRODUCTION OF COMMISSIONER VERNON LANING

Chairman Yeager introduced Vernon Laning, a new Commissioner representing the extraterritorial area.

CONSIDERATION – PRELIMIARY PLAT – SCHMITT SUBDIVISION

Chairman Yeager called for consideration of the following consent agenda item:

A preliminary plat for Schmitt Subdivision. The property is 1 lot in 1 block on 2.9 acres located south of Lincoln in Swansonville, 1/8 mile east of 52nd Street SE on the south side of 48th Avenue SE (NW ¼ of Section 30, T138N-R79W/Apple Creek Township).

MOTION: Commissioner Hegedus made a motion to approve the consent agenda. Commissioner Laning seconded the motion and it was unanimously approved with Commissioners Armstrong, Bullinger, Hegedus, Juhala, Laning, Selzler, Waldoch and Yeager voting in favor of the motion.

FINAL CONSIDERATION – ANNEXATION AND PUBLIC HEARING – ZONING CHANGE FROM R5-RESIDENTIAL TO R10-RESIDENTIAL AND FINAL PLAT – COUNTRY WEST XXX

Chairman Yeager called for the final consideration for the annexation and the public hearing for the zoning change from the R5-Residential zoning district to the R10-Residential zoning district and the final plat for Country West XXX. The property is located along the north side of Valley Drive at the intersection with Tyler Parkway (part of the SE ¼ of Section 19, T139N-R80W/Hay Creek Township).

Ms. Lee provided an overview of the request and listed the following findings for the annexation:

1. The City and other agencies would be able to provide necessary public services, facilities and programs to serve the development allowed by the annexation at the time the property is developed.

2. The proposed annexation would not adversely affect property in the vicinity.

3. The proposed annexation is consistent with the general intent and purpose of Title 14 of the City Code of Ordinances.

4. The proposed annexation is consistent with the master plan, other adopted plans, policies and planning practice.

Ms. Lee then listed the following findings for the zoning change:

1. The proposed zoning change would be consistent with the Land Use Plan, which identifies this area as open space adjacent to residential (Bismarck-Mandan Regional Land Use Plan). Given the topography of the property, it is reasonable to allow an administrative amendment to the land use plan to move the dividing line between the two land uses to the north side of the proposed lots.

2. The proposed zoning change is compatible with adjacent land uses. There is single-family residential to the south and west, park property to the east and undeveloped land to the north.

3. The subdivision proposed for this property would be completely annexed prior to development and utilities are already in place in Valley Drive; therefore, the zoning change will not place an undue burden on public services.

4. The proposed zoning change would not adversely affect property in the vicinity.

5. The proposed zoning change is consistent with the general intent and purpose of the zoning ordinance.

6. The proposed zoning change is consistent with all adopted plans, policies and accepted planning practice.

Ms. Lee then listed the following findings for the plat:

1. All technical requirements for approval of a final plat have been met.

2. The proposed subdivision is consistent with the Fringe Area Road Master Plan, which identifies both Valley Drive and Tyler Parkway as collectors.

3. A waiver from the storm water management plan submittal requirements has been approved by the City Engineer.

4. The proposed subdivision is compatible with adjacent land uses. There is single-family residential to the south and west, park property to the east and undeveloped land to the north.

5. The proposed subdivision would be completely annexed prior to development and utilities are already in place in Valley Drive; therefore, the proposed subdivision will not place an undue burden on public services.

6. The proposed subdivision would not adversely affect property in the vicinity.

7. The proposed subdivision is consistent with the general intent and purpose of the zoning ordinance and subdivision regulations.

8. The proposed subdivision is consistent with the master plan, other adopted plans, policies and accepted planning practice.

Ms. Lee said based on the above findings, staff recommends approval of the annexation, zoning change from the R5-Residential zoning district to the R10-Residential zoning district and final plat for Country West XXX.

Chairman Yeager called for the final consideration for the annexation and the public hearing for the plat, zoning change from the R5-Residential zoning district to the R10-Residential zoning district and final plat for Country West XXX.

Wade Felton said his family owns land to the north of this proposed plat and is concerned with access to his property and is requesting that that access to the north be included with the plat and annexation of Country West XXX. Mr. Felton went on to say that his fear is if an extension of Tyler Parkway is not included, then there would not be any developable property from where

Mr. Clairmont's proposed plat ends. He added that if there is not right-of-way across the embankment, they will be opposed the proposed plat.

Chairman Yeager closed the public hearing.

MOTION: Based on the findings contained in the staff reports, Commissioner Armstrong made a motion to continue the final consideration for the annexation and the public hearing for the zoning change from R5-Residential zoning district to R10-Residential zoning district and the final plat for Country West XXX to provide staff with time to review the need to provide an extension of Tyler Parkway in conjunction with this plat. Commissioner Hegedus seconded the motion and it was unanimously approved with Commissioners Armstrong, Bullinger, Hegedus, Juhala, Laning, Selzler, Waldoch and Yeager voting in favor of the motion.

PUBLIC HEARING –ZONING CHANGE FROM A-AGRICULTURAL TO RR-RESIDENTIAL FOR LOT A OF THE NE¼ OF SECTION 2, T139N-R80W/HAY CREEK TOWNSHIP

Chairman Yeager called for the public hearing for the zoning change from A-Agricultural zoning district to RR-Residential zoning district for Lot A of the NE¼ of Section 2, T139N-R80W/Hay Creek Township. The property is located 1¾ miles east of US Highway 83 south of 84th Avenue NE, along the west side of Arcata Drive (in the NE¼ of Section 2, T139N-R80W/ Hay Creek Township).

Mr. Greenquist provided an overview of the request and listed the following findings for the zoning change:

1. The proposed zoning change is compatible with adjacent land uses. Adjacent land uses include large-lot rural residential to the west, south, and east. The land to the north is undeveloped agricultural.

2. The existing use of this parcel is rural residential. It is served by South Central Regional Water District and has access to 84th Avenue NE; therefore, the zoning change will not place an undue burden on public services.

3. The proposed zoning change would not adversely affect property in the vicinity.

4. The proposed zoning change is consistent with the general intent and purpose of the zoning ordinance

5. The proposed zoning change is consistent with the master plan, other adopted plans, policies and planning practice.

Mr. Greenquist added that the Board of Adjustment granted a variance for this property for an accessory building contingent upon the zoning being approved.

Mr. Greenquist said based on the above findings, staff recommends approval of the zoning change from A-Agricultural zoning district to RR-Residential zoning district for Lot A of the NE¼ of Section 2, T139N-R80W/Hay Creek Township.

Chairman Yeager opened the public hearing for the zoning change from A-Agricultural zoning district to RR-Residential zoning district for Lot A of the NE¼ of Section 2, T139N-R80W/Hay Creek Township.

No public comment was received.

Chairman Yeager closed the public hearing.

MOTION: Based on the findings contained in the staff report, Commissioner Hegedus made a motion to approve the zoning change from A-Agricultural zoning district to RR-Residential zoning district for Lot A of the NE¼ of Section 2, T139N-R80W/Hay Creek Township. Commissioner Waldoch seconded the motion and it was unanimously approved with Commissioners Armstrong, Bullinger, Hegedus, Juhala, Laning, Selzler, Waldoch and Yeager voting in favor of the motion.

PUBLIC HEARING – SPECIAL USE PERMIT FOR LOT 8, BLOCK 2, TIBESAR'S FIRST ADDITION (1911 11th STREET NORTH)

Chairman Yeager called for the public hearing for a special use permit to allow a day care facility for Lot 8, Block 2, Tibesar's First Addition. The property is located at 1911 11th Street North along the east side of 11th Street North between Divide and Capitol Avenues.

Mr. Tomanek provided an overview of the requests and listed the following findings for the special use permit:

1. The proposed special use complies with all applicable provision of the zoning ordinance and is consistent with the general intent and purpose of the zoning ordinance.

2. The proposed special use would not adversely affect the public health, safety and general welfare.

3. The proposed special use would not be detrimental to the use or development of adjacent properties.

4. The use would be designed, operated and maintained in a manner that is compatible with the appearance of the existing character of the surrounding area.

5. Adequate public facilities and services are in place.

6. The use would not cause a negative cumulative effect, when considered in conjunction with the cumulative effect of other uses in the immediate vicinity.

7. Adequate measures have been taken to minimize traffic congestion in the public streets and provide for appropriate on-site circulation of traffic. In particular, adequate off-street parking would be provided.

Mr. Tomanek also provided the following additional information:

1. The day care is intended to accommodate up to 49 children ranging in age from 0-12 years.

2. The applicants have been working with the Building Official to satisfy all of the requirements necessary to meet the guidelines set forth to establish and operate a daycare facility. In particular, the appropriate accommodations have been met to allow for adequate outdoor play space for the children, appropriate parking and ADA compliant restroom facilities.

3. Section 14-03-08(4)(r) of the City Code of Ordinances outlines the requirements for a day care center.

Mr. Tomanek said that based on the above findings, staff recommends approval of the special use permit to allow the operation of a day care facility at 1911 11th Street North (Lot 8, Block 2, Tibesar's First Addition) with the following conditions: 1) the configuration of the day care facility closely resemble the proposed layout included with the application, and 2) the number of children allowed to occupy the day care facility be limited to less than 50.

Chairman Yeager opened the public hearing for the special use permit on Lot 8, Block 2, Tibesar's First Addition (1911 11th Street North).

Commissioner Bullinger asked if the fence will be chain link or privacy. Michelle Gust with The Enrichment Garden said it will be a chain link fence with privacy slats.

Commissioner Laning inquired if there are any issues with the use being limited to less than 50 children. Ms. Gust responded by saying there are no issues with the limit of less than (49 is max) 50 children or less.

Commissioner Waldoch asked where the proposed outdoor play area will be located. Ms. Gust answered by saying the play area will be on the east side of building.

Chairman Yeager closed the public hearing.

MOTION: Based on the findings contained in the staff report, Commissioner Laning made a motion to approve the special use permit for a day care facility at 1911 11th Street North (Lot 8, Block 2, Tibesar's First Addition) with the following conditions: 1) the configuration of the day care facility closely resemble the proposed layout included with the application and 2) the number of children allowed to occupy the day care facility be limited to less than 50. Commissioner Hegedus seconded the motion and it was unanimously approved with Commissioners Armstrong,

Bullinger, Hegedus, Juhala, Laning, Selzler, Waldoch and Yeager voting in favor of the motion.

PUBLIC HEARING – ZONING ORDINANCE TEXT AMENDMENT – FP FLOODPLAIN DISTRICT

Chairman Yeager called for the public hearing for the zoning ordinance text amendment relative to the FP Floodplain District.

Ms. Lee provided an overview of the zoning ordinance text amendment for the FP Floodplain District. The proposed ordinance would bring the ordinance in line with FEMA's model ordinance for this region and will include additional provisions to minimize losses within the floodplain.

Mr. Lee said staff recommends approval of the zoning ordinance text amendment relative to the FP Floodplain District.

Chairman Yeager opened the public hearing for the zoning ordinance text amendment relative to the FP Floodplain District.

Commissioner Bullinger said he attended the public input meeting in May and at the meeting it was announced that the public hearing on this zoning ordinance text amendment would be on June 23, 2010. Commissioner Bullinger then asked Ms. Lee how the public hearing was advertised. Ms. Lee responded by saying it was published for two weeks prior to the meeting in the Bismarck Tribune and also placed on the City of Bismarck's website under public notices. Commissioner Bullinger inquired whether or not any feedback was received between the May public input meeting and now. Ms. Lee said she has not received any, but Mr. Ziegler received one or two comments.

Commissioner Armstrong asked if the ordinance would have to be amended every time the base flood elevation changes. Ms. Lee said yes, because the map references would need to be updated.

Gailen Narum with Burleigh County Water Resource District distributed the Technical Bulletin 10-01, attached as Exhibit A. Mr. Narum also distributed and read the Floodplain Ordinance Position Statement Bismarck Planning and Zoning Commission – June 23, 2010, attached as Exhibit B.

Paul Zent with Apple Creek Township asked if roads and streets are included in the proposed ordinance. Ms. Lee said that public rights-of-way are not included in the proposed ordinance because the City and County Engineering Departments address those issues with roadway standards. Zoning typically only applies to private property.

Mr. Ziegler commented that if there is going to be a basement or crawl space constructed, the inspectors strongly recommend that FEMA's the Technical Bulletin 10-01 is followed. Mr. Ziegler added that the items in the technical bulletin are only recommendations by FEMA and not requirements; however, builders have been very accommodating to meet those recommendations.

Chairman Yeager closed the public hearing.

MOTION: Commissioner Hegedus made a motion to approve the zoning ordinance text amendment relative to the FP Floodplain District, with the proposed change from the wording "assessed value" to "market value as assessed". Commissioner Armstrong seconded the motion and it was unanimously approved with Commissioners Armstrong, Bullinger, Hegedus, Juhala, Laning, Selzler, Waldoch and Yeager voting in favor of the motion.

OTHER BUSINESS

There was no other business.

ADJOURNMENT

There being no further business Chairman Yeager declared the Bismarck Planning & Zoning Commission adjourned at 6:28 p.m. to meet again on July 28, 2010.

Respectfully submitted,

_____
Kimberley Gaffrey
Recording Secretary

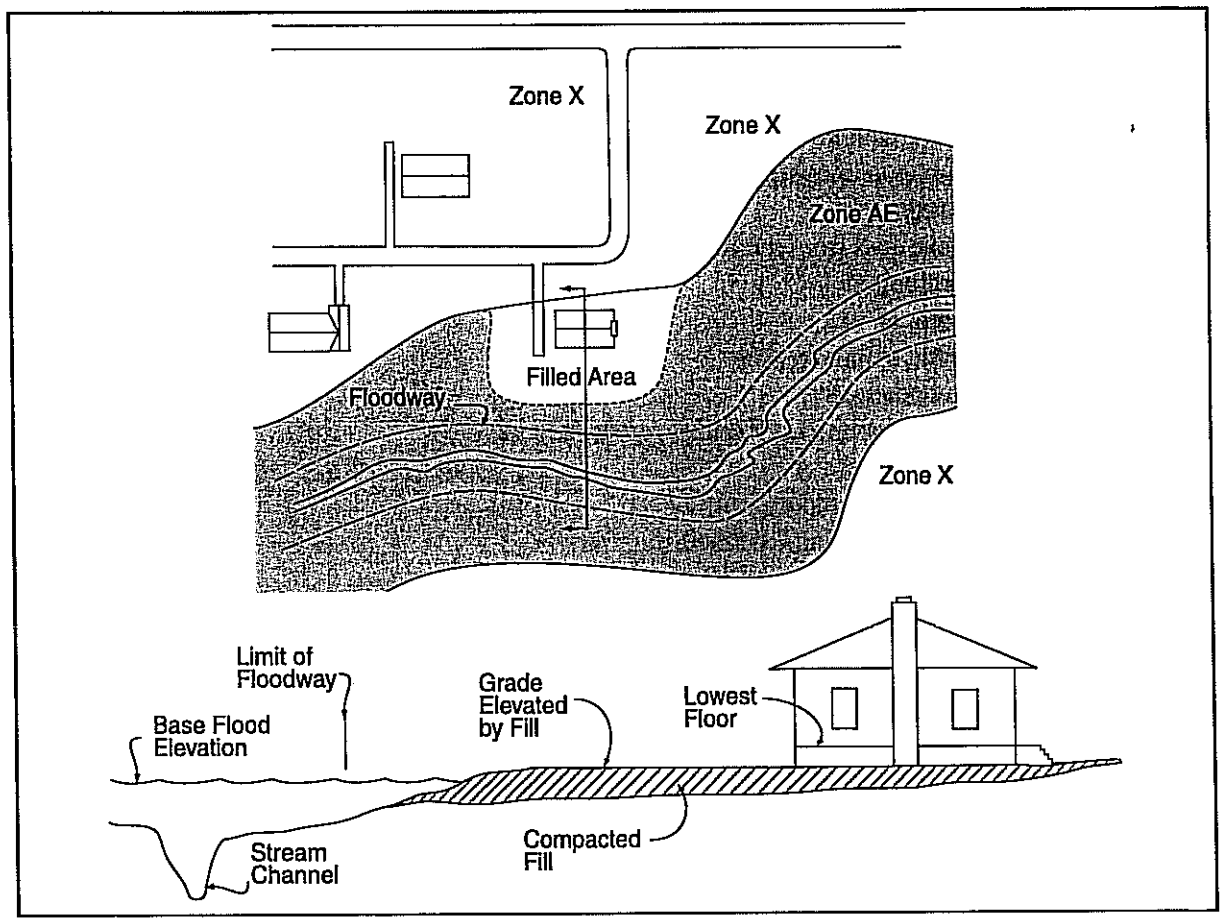
_____
Wayne Yeager
Chairman

Technical Bulletin 10-01

Ensuring That Structures Built on Fill In or Near Special Flood Hazard Areas Are Reasonably Safe From Flooding

in accordance with the

National Flood Insurance Program



FEDERAL EMERGENCY MANAGEMENT AGENCY
MITIGATION DIRECTORATE

FIA-TB-10
(5/01)

EXHIBIT A

Key Word/Subject Index

This index allows the user to locate key words and subjects in this Technical Bulletin. The Technical Bulletin User's Guide (printed separately) provides references to key words and subjects throughout the Technical Bulletins. For definitions of selected terms, refer to the Glossary at the end of this bulletin.

Any comments on the Technical Bulletins should be directed to:

Federal Emergency Management Agency
Mitigation Directorate
Program Policy and Assessment Branch
500 C Street, SW.
Washington, DC 20472

Wave design on cover based on the Japanese print *The Great Wave Off Kanagawa*, by Katsuchika Hokussai (1760–1849), Asiatic Museum of Fine Arts, Boston.

TECHNICAL BULLETIN 10-01

Ensuring That Structures Built on Fill In or Near Special Flood Hazard Areas Are Reasonably Safe From Flooding in accordance with the National Flood Insurance Program

Introduction

For the purpose of administering the National Flood Insurance Program (NFIP), FEMA identifies and maps flood hazard areas nationwide by conducting flood hazard studies and publishing Flood Insurance Rate Maps (FIRMs). These flood hazard areas, referred to as Special Flood Hazard Areas (SFHAs), are based on a flood having a 1-percent probability of being equaled or exceeded in any given year (also referred to as the 100-year flood or Base Flood).

Structures within the SFHA in a community participating in the NFIP are subject to floodplain management regulations that impact building standards and are designed to minimize flood risk. For example, Title 44, Part 60, Section 3(c)(2) of the Code of Federal Regulations—abbreviated as 44 CFR 60.3(c)(2)—requires that the lowest floor of a residential structure, including basement, built within the SFHA be at or above the Base Flood Elevation (BFE). In addition, flood insurance must be purchased for these structures if they are used as collateral to secure a loan provided by a federally regulated lender. Flood insurance coverage may be purchased for all eligible structures within a participating community. Insurance rates for structures located within the SFHA differ from the rates for structures located outside the SFHA.

When permitted under applicable Federal, state, and local laws, ordinances, and regulations, earthen fill is sometimes placed in an SFHA to reduce flood risk to the filled area. Under certain conditions, when engineered earthen fill is placed within an SFHA to raise the surface of the ground to or above the BFE, a request may be submitted to FEMA to revise the FIRM to indicate that the filled land is outside of the SFHA. When such revisions are warranted, FEMA usually revises the FIRM by issuing a Letter of Map Revision based on fill (LOMR-F). After FEMA has revised the FIRM to show that the filled land is outside the SFHA, the community is no longer required to apply the minimum NFIP floodplain management standards to any structures built on the land and the mandatory flood insurance purchase requirements no longer apply. It is worth noting that states and local communities may have floodplain regulations that are more restrictive than the minimum requirements of the NFIP and may continue to enforce some or all of their floodplain management requirements in areas outside the SFHA.

Although a structure built on a site that has been elevated by the placement of fill may be removed by FEMA from the SFHA, the structure may still be subject to damage during the Base Flood and higher-magnitude floods. Constructing the entire structure at or above the level of the BFE will minimize the flood risk from the Base Flood and is therefore the most prudent approach to constructing on fill. Conversely, a structure with a basement (subgrade area) adjacent to or near the floodplain may well be impacted by subsurface flooding brought on by surface flooding.

This bulletin provides guidance on the construction of buildings on land elevated above the BFE through the placement of fill. Several methods of construction are discussed, and the most prudent—those that result in the entire building being above the BFE—are recommended.

In some areas of the country, basements are a standard construction feature. Individuals may wish to construct basements on land after it has been removed from the floodplain by a FEMA revision. Buildings with basements built in filled areas are at an added risk of flooding when compared to buildings on other types of foundations. However, there are two major ways to minimize this additional risk from subsurface flooding. First, the building should be located farther back from the edge of the fill closest to the flooding source. Second, the higher the basement floor is elevated, the less the risk. This technical bulletin provides guidance on how to determine that these buildings will be reasonably safe from flooding during the occurrence of the Base Flood and larger floods. To be reasonably safe from flooding during the Base Flood condition, the basement must (1) be dry, not have any water in it, and (2) be structurally sound, not have loads that either exceed the structural capacity of walls or floors or cause unacceptable deflections. In practice, this means that soils around the basement must have low permeability to minimize or stop water infiltration to the basement wall and floors. Any water that does permeate to the basement must be removed by a drainage layer on the outside (soil side) of the basement. In addition, the foundation walls and floor slab must be designed and constructed for any increased loads that may occur during the Base Flood condition.

NFIP Regulations

Part of a community's application to participate in the NFIP must include "a commitment to recognize and duly evaluate flood hazards in all official actions in the areas having special flood hazards and to take other such official actions reasonably necessary to carry out the objectives of the program" [44 CFR 59.22 (a)(8)].

NFIP regulations at 44 CFR 60 include Subpart A: Requirements for Flood Plain Management Regulations. Each community participating in the NFIP adopts a floodplain management ordinance that meets or exceeds the minimum requirements listed in 44 CFR 60. Subpart A establishes specific criteria for determining the adequacy of a community's floodplain management regulations. The overriding purpose of the floodplain management regulations is to ensure that participating communities take into account flood hazards, to the extent that they are known, in all official actions relating to land management and use.

One of the minimum requirements established by the regulations is set forth at 44 CFR 60.3 (a)(3), which states that, for all proposed construction or other development within a participating community, the community must "Review all permit applications to determine whether the proposed building sites will be reasonably safe from flooding." 44 CFR 59.1 defines "development" as

> *"...any manmade change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operation or storage of equipment or materials,"*

Warning

Construction of a residential building in an identified SFHA with a lowest floor below the BFE is a violation of the floodplain management requirements set forth at 44 CFR 60.3(c)(2), unless the community has obtained an exception to NFIP requirements from FEMA and has approved procedures in place.

By issuance of this Technical Bulletin, FEMA is noting that residual flood hazards may exist in areas elevated above the BFE by the placement of engineered earthen fill. Residual risks in these areas include subsurface flood conditions and flooding from events that exceed the base flood. This bulletin is intended to guide local floodplain management officials in determining whether structures placed in filled areas are reasonably safe from flooding. FEMA will require that the jurisdiction having authority for floodplain management determine that an area is reasonably safe from flooding before removing it from the SFHA.

Floodways, V Zones, and Alluvial Fan Flood Hazard Areas

This bulletin does **not** apply to the following:

- Construction in the floodway. The NFIP prohibits encroachments into the floodway that would cause increases in flood stage.
- Construction in SFHAs designated Zone V, VE, or V1-V30 on FIRMs. The NFIP prohibits the use of structural fill for support of buildings in V zones. Buildings constructed in a V zone must be constructed on an open foundation consisting of piles, piers, or posts and must be elevated so that the bottom of the lowest horizontal structural member is at or above the BFE. In addition, this bulletin strongly recommends that structural fill **not** be used to elevate buildings constructed in A zones in coastal areas. Detailed guidance concerning proper construction methods for buildings in coastal areas is presented in FEMA's *Coastal Construction Manual* (FEMA 55) and in NFIP Technical Bulletin 5, *Free-of-Obstruction Requirements*.
- Construction in SFHAs subject to alluvial fan flooding (designated Zone AO with depths and velocities shown on FIRMs). The NFIP will not remove land from the floodplain based on the placement of fill in alluvial fan flood hazard areas.

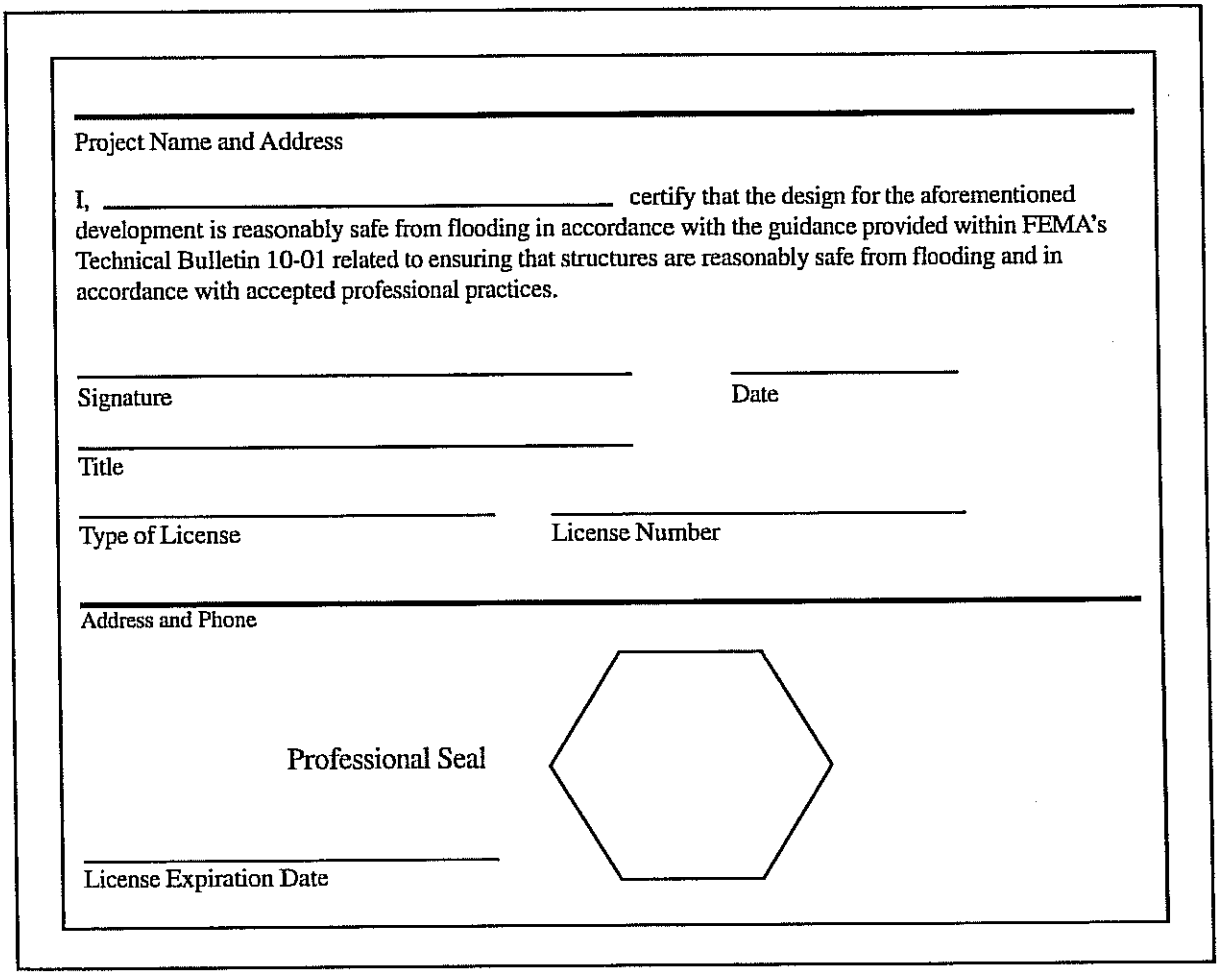
More Restrictive State and Local Requirements

NFIP Technical Bulletins provide guidance on the **minimum** requirements of the NFIP regulations. State or local requirements that exceed those of the NFIP take precedence. Design professionals should contact community officials to determine whether more restrictive state or local regulations apply to the building or site in question. All applicable standards of the state or local building code must be met for any building in a flood hazard area.

Notes for Local Officials

Professional Certification

As required by state and local floodplain management ordinances, a proposed development must be determined to be reasonably safe from flooding. The official having the authority to make this determination should require all appropriate information for making the determination. This may include a certification by a qualified design professional that indicates the land or structures to be removed from the SFHA are reasonably safe from flooding, according to the criteria described in this technical bulletin. Such a professional certification may come from a professional engineer, professional geologist, professional soil scientist, or other design professional qualified to make such evaluations. A sample of such a certification is shown in Figure 1.



Project Name and Address

I, _____ certify that the design for the aforementioned development is reasonably safe from flooding in accordance with the guidance provided within FEMA's Technical Bulletin 10-01 related to ensuring that structures are reasonably safe from flooding and in accordance with accepted professional practices.

_____ _____

Signature Date

_____

Title

_____ _____

Type of License License Number

_____

Address and Phone

Professional Seal

_____

License Expiration Date

Figure 1 Sample of professional certification form.

Administrative Options for Community Permitting

Communities may choose a variety of administrative procedures to assist them in gathering information that can be used to determine whether a proposed development is reasonably safe from flooding. Communities are encouraged to establish procedures that alert them to potential future development of a filled area. These procedures should allow for the evaluation of future development and a means to determine whether it will be reasonably safe from flooding. The following are examples of such procedures:

- Require building sites to be identified on final subdivision plats and evaluate those building sites against the standards described in this Technical Bulletin.
- Require grading plans as a condition of issuing fill permits and require that those grading plans include building sites, and evaluate those building sites based on this Technical Bulletin.
- Require buffer zones or setback zones around the perimeter of fill pads or at the edge of the floodplain and establish construction requirements within these buffer zones to ensure that buildings are safe from residual risk.
- Require as a condition of final subdivision plat approval that the developer agree that no basements will be built in any flood areas.
- Adopt or have regulations that control development of areas immediately adjacent to floodplains that would ensure that any construction is reasonably safe from flooding. For example, under the Minnesota State Building Code, communities designate areas outside of the floodplain as "Secondary Flood Hazard Areas" where building officials evaluate plans for basements and can require modifications to the basement if an official believes there is a residual risk.
- When issuing a permit for the placement of fill only in the SFHA, stipulate that no buildings will be built on the site without a subsequent building permit.

Placement of Fill

Properly placing fill requires an understanding of soil mechanics, local site conditions, the specific characteristics of the soils being placed, the methods used to place and compact the fill, and soil testing procedures. Standard engineering and soil mechanics texts cover these subjects in detail. The performance of these filled areas should consider, but is not limited to, the following:

- the consolidation of the fill layers and any underlying layers
- the effect of this consolidation on either excessive settlement or differential settlement
- how the permeability of the soils affects water infiltration on any structures built on the site

Loss of Storage and Conveyance

The placement of fill in the SFHA can result in an increase in the BFE by reducing the ability to convey and store flood waters. This can result in increased flood damage to both upstream and downstream properties. To prevent these possible results, some communities prohibit fill, require compensatory storage for filled areas, and/or identify a more restrictive floodway.

Risk of Flood Damage in Areas Adjacent to the SFHA

Areas adjacent to the SFHA may have residual risks of flood damage similar to those in areas removed from the SFHA through the placement of fill. Both areas are subject to residual risk from subsurface water related to flooding and from floods greater than the Base Flood. Methods of construction discussed in this bulletin should also be used in these areas.

Building on Land Removed From the SFHA by the Placement of Fill

The safest methods of constructing a building on filled land removed from the SFHA are those that result in the entire structure being above the BFE. Methods that place the lowest floor of the building at, rather than above, the BFE are at greater flood risk, and methods that result in the lowest floor (including a basement floor) below the BFE have the highest flood risk of all. Placement of the lowest floor of these structures below the BFE, even through they are outside the SFHA, will result in an increased threat from subsurface flooding and magnified damages from flooding that exceeds the BFE.

Freeboard

Freeboard is an additional height used as a factor of safety in determining the elevation of a structure, or floodproofing, to compensate for factors that may increase the flood height (ASCE 24-98, *Flood Resistant Design and Construction*). When fill is used to protect buildings from the Base Flood, the community should consider whether freeboard should be required. This consideration should include whether better information exists or conditions have changed (from when the BFE was originally established) that indicate that the BFE may be higher than originally expected. One example of when the BFE may be higher is when a culvert or bridge is blocked by debris. Flood modeling assumes an open channel or culvert. Even when the BFE is not expected to be higher, freeboard may be appropriate to provide increased protection from flood events less frequent than the Base Flood or to account for future changes that may increase the BFE.

The foundation types for buildings outside the SFHA described in the following sections are listed in order of their increasing risk of flood damage.

Non-Basement Foundations

Non-basement foundations consist primarily of stem wall, crawlspace, and slab-on-grade foundations.

Stem Wall Foundation

A stem wall foundation can be used to raise the lowest floor above the surrounding grade. After the stem walls have been constructed and extended to the desired elevation, the area enclosed by the stem walls is filled with engineered compacted fill and a slab is poured on top (see Figure 2). Through the placement of additional fill, the site may be elevated above the BFE. This approach provides freeboard—an additional amount of elevation that helps protect against subsurface flooding and floods that exceed the Base Flood. Constructing a stem wall foundation and placing this additional fill on the site provide the highest level of flood protection.

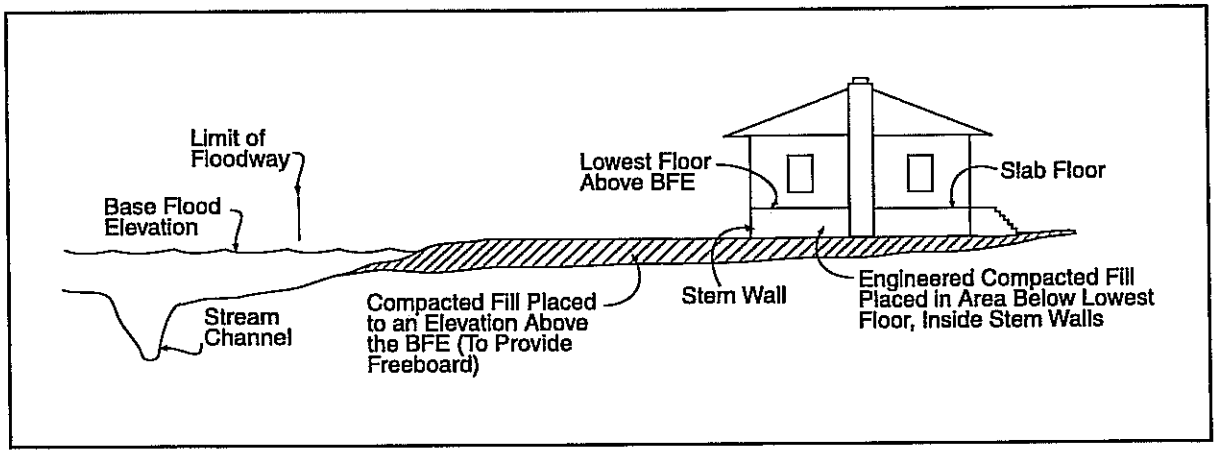


Figure 2 Structure on a stem wall foundation. The lowest floor is raised above the BFE. The space enclosed by the stem walls is filled with engineered compacted fill.

Crawlspace Foundation

Constructing a crawlspace beneath the first floor will raise the lowest floor of the structure above the surrounding grade (see Figure 3). Openings in the foundation walls are recommended. If flooding reaches the building, the openings allow flood waters to enter the area below the lowest floor and equalize the hydrostatic pressure on the foundation walls (see NFIP Technical Bulletin 1, *Openings In Foundation Walls*).

The crawlspace alternative is less preferable than stem wall construction, which does not result in an enclosed area under the first floor and therefore requires no flood openings. Placing additional fill to a level above the BFE provides freeboard that helps protect against subsurface flooding and floods that exceed the Base Flood. Constructing a crawlspace foundation and placing additional fill on the site provide increased flood protection.

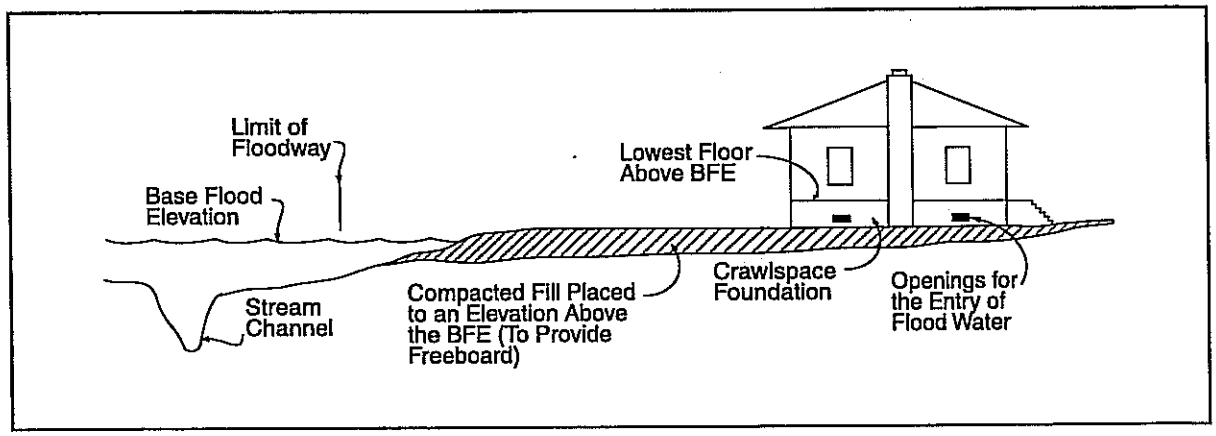


Figure 3 Structure on a crawlspace foundation. The lowest floor is raised above the BFE. Openings in the foundation walls allow water from floods higher than the fill elevation to enter the crawlspace and equalize the pressure on foundation walls.

Slab-On-Grade Foundation

This method normally provides less flood protection than crawlspace construction because it does not elevate the house above the adjacent grade (see Figure 4). As a result, the lowest floor of the house can be as low as the BFE and would be inundated by any flood greater than the BFE. Placing additional engineered fill beneath the building to a level above the BFE would provide freeboard and therefore increased flood protection.

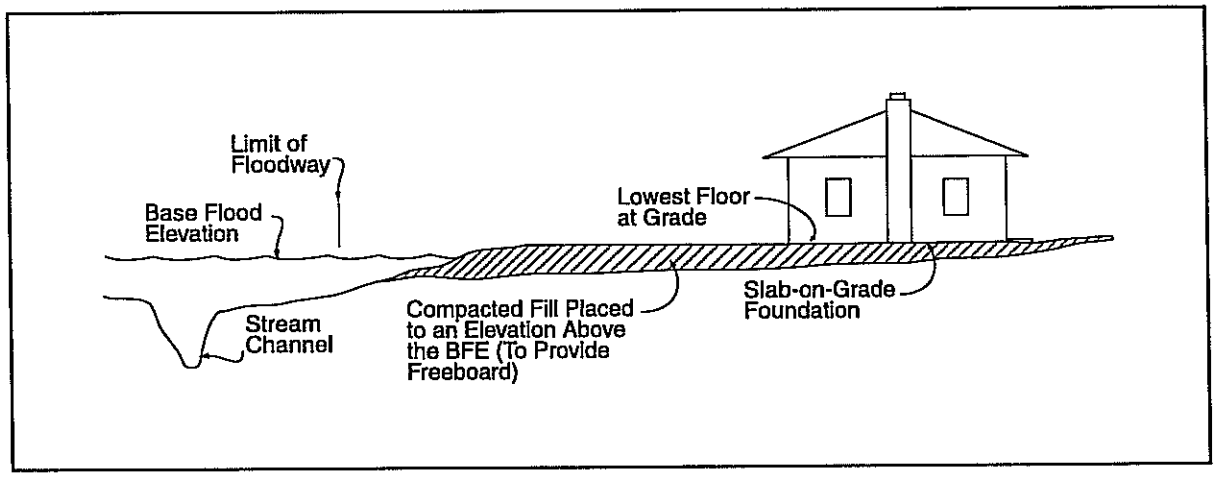


Figure 4 Structure on a slab-on-grade foundation. The lowest floor is typically slightly higher than the surrounding grade.

Basement Foundations

Although basements are a desired feature in some areas of the United States, NFIP minimum requirements generally do not allow their construction in the SFHA, because of the increased risk of flood damages. The only instances where this is not the case are buildings for which FEMA has granted a special exemption to allow floodproofed basements. However, once land is removed from the SFHA through a map revision, these NFIP minimum requirements no longer apply. As a result, builders and property owners who build on land removed from the SFHA sometimes elect to install basements, which are at a higher risk of flood damage than the foundation types described previously.

Constructing a basement on such land is **not** recommended, because the basement (i.e., lowest) floor and portions of the basement walls may well be subjected to subsurface flooding. The basement may therefore be subject to seepage and lateral hydrostatic and uplift pressure caused by high groundwater levels associated with flooding in surrounding areas. Additionally, when flooding exceeds the BFE, the basement area may be totally inundated with floodwater. When builders and homeowners decide to accept the additional risk associated with basement construction on filled land, they need to ensure that the basement and the rest of the house are reasonably safe from flooding.

Warning

In filled areas adjacent to floodplains, floods can still greatly influence the groundwater at the filled site. High groundwater at a site with a basement can result in water infiltrating the basement or greatly increased hydrostatic pressures on the walls and basement slab that can cause failure or permanent deformation. Even when floods have not reached houses with basements, FEMA has seen numerous examples of flooded basements, bowed basement floors, and collapsed basement walls that have resulted from the effects of high groundwater caused by flooding. In addition, the collapse of flooded basements has also occurred when water is rapidly pumped from basements surrounded by saturated soils whose pressure exceeds the capacity of the basement walls.

Flood Insurance Coverage for Basements

It is extremely important to note that the NFIP offers only limited coverage for basement flooding. First, in order for a claim to be paid, there must be a general condition of overland flooding where floodwaters come in contact with the structure. Secondly, the NFIP does not provide coverage for finished nonstructural elements such as paneling and linoleum in basement areas. Contents coverage is restricted to a limited number of items listed in the flood insurance policy. Contact a local insurance agent for more information.

Four basement construction methods are described below in increasing order of flood risk.

Basement Foundation With Lowest Floor At or Above BFE

Placing the lowest floor of the basement at or above the BFE has the effect of eliminating flood-induced damage up to the BFE (see Figure 5). In general, the higher the basement floor is above the BFE the lower the risk of damage from seepage and hydrostatic pressure caused by flood-related groundwater. Where possible, the basement should be built with its floor at or above the BFE. An added benefit is that floods that exceed the BFE will cause significantly less damage to a structure with this type of basement than to structures with basements whose floors are at greater depths.

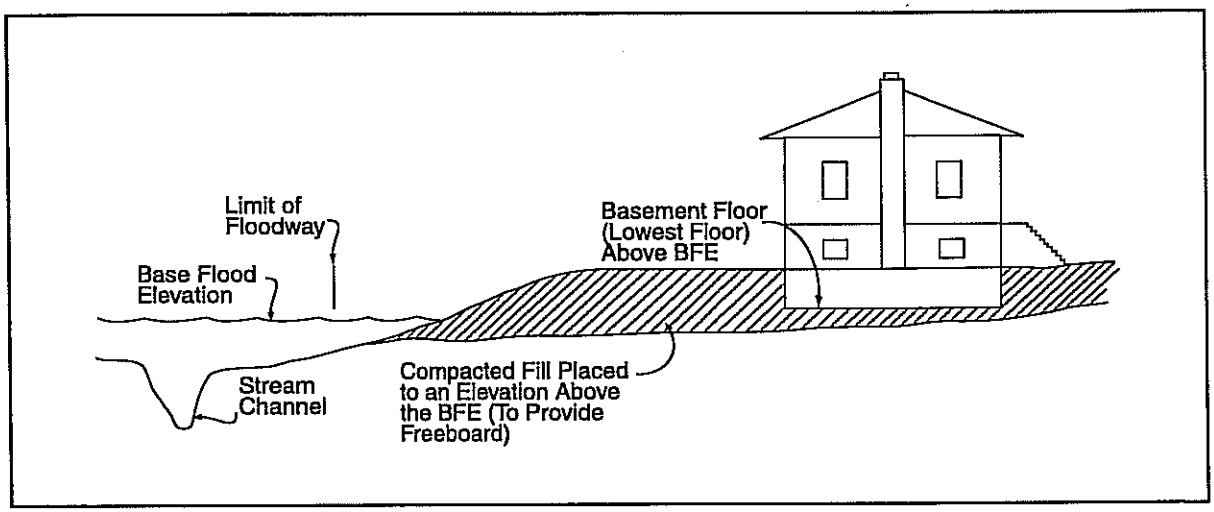


Figure 5 Basement foundation with lowest floor above the BFE. Damage from floods below the BFE is eliminated.

Basement Foundation in Fill Placed Above BFE

Placing fill to a level higher than the BFE has the effect of reducing the depth of the basement floor below the BFE (see Figure 6). It is recommended that fill be placed to a level at least 1 foot above the BFE. In general, the higher the basement floor the lower the risk of damage from seepage and hydrostatic pressure caused by flood-related groundwater. Where possible, enough fill should be properly placed so that the lowest grade adjacent to the structure is raised to an elevation greater than the BFE. An added benefit of fill placed above the BFE is that it helps protect the building from floods greater than the Base Flood. These floods are less likely to reach the structure.

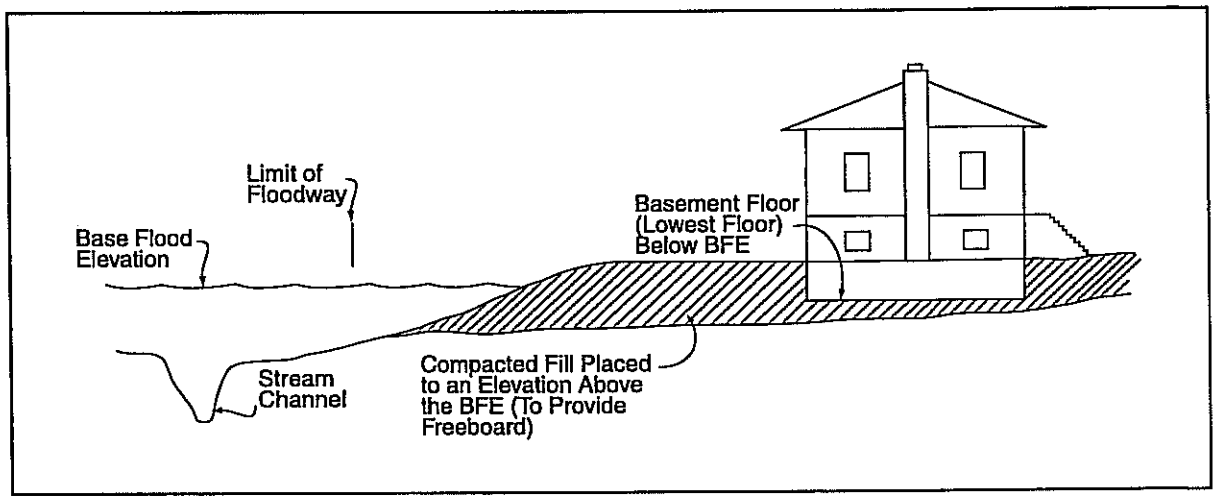


Figure 6 Basement foundation in fill placed above the BFE. The depth of the basement floor below the BFE is less than when no fill is placed.

Basement Foundation With Lowest Opening Above BFE

In the event that the lowest floor is not elevated to or above the BFE and fill is not placed to a level above the BFE, the next best method of reducing flood risk is to place the lowest opening into the basement (e.g., window well) at a level higher than the BFE (see Figure 7). This will reduce the chances that surface flooding will enter and inundate the basement. However, the basement walls and floor slab will still be subjected to hydrostatic pressure with the potential for damage and seepage into the basement. In addition, the above-grade basement walls will be exposed to water from floods greater than the Base Flood. For this reason, the lowest opening in the basement walls should be above the BFE, as shown in Figure 7.

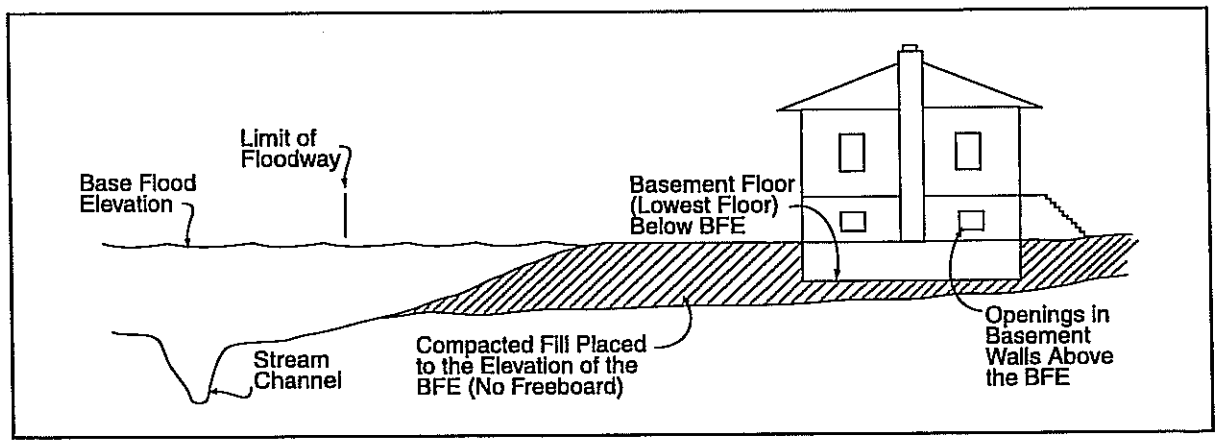


Figure 7 Basement foundation with lowest opening above the BFE. Surface flooding is less likely to enter and inundate the basement.

Basement Foundation With Lowest Opening at BFE

This is the least preferable condition of all because it results in the highest flood risk and is not recommended (see Figure 8). The lack of fill above the BFE, coupled with the lowest floor being below BFE and lowest opening at the BFE, exposes the basement to flooding from both subsurface flooding and any flood greater than the Base Flood.

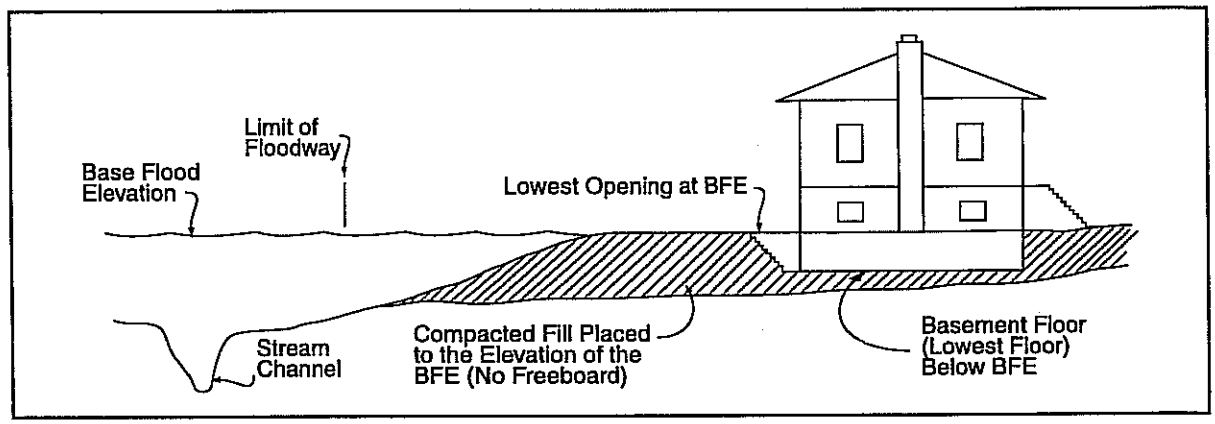
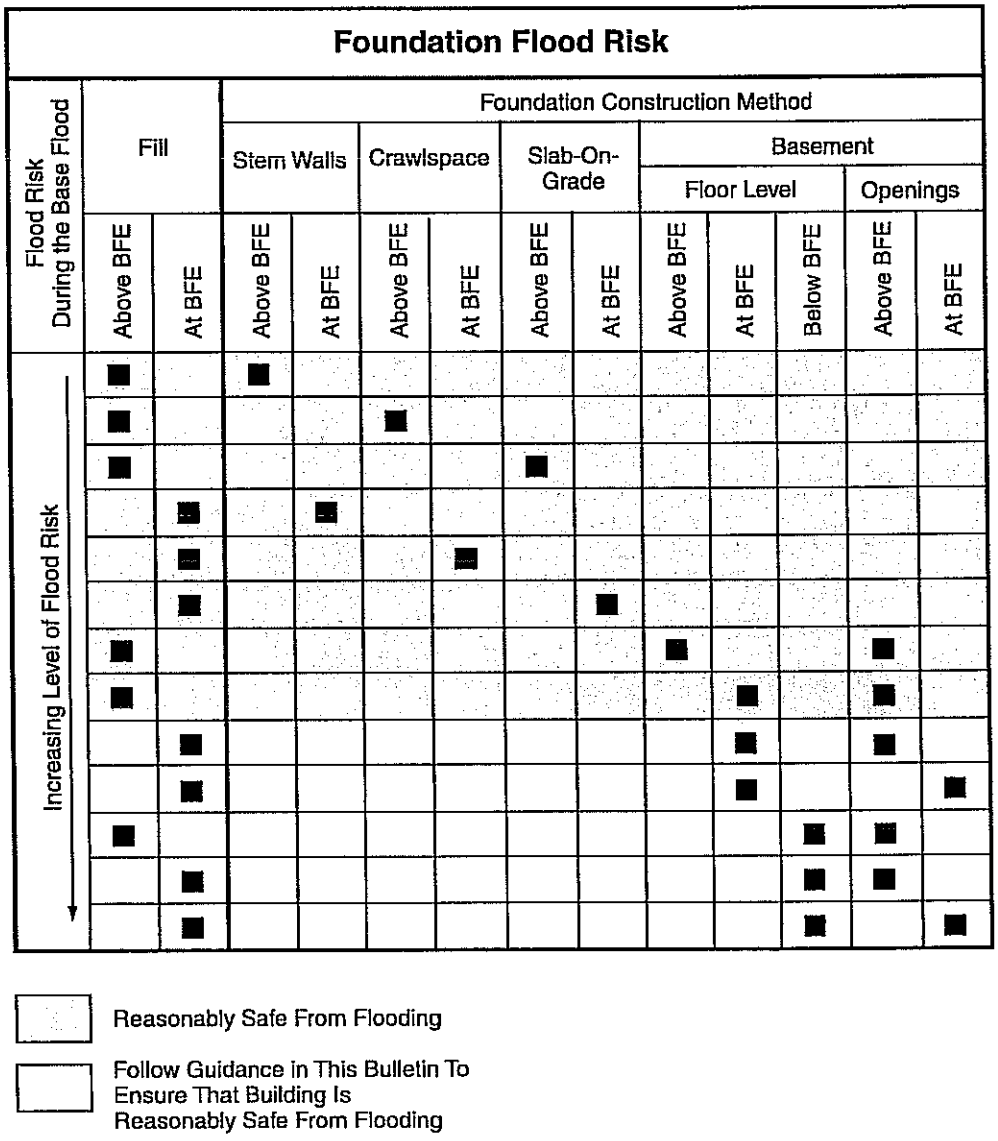


Figure 8 Basement foundation with lowest opening at the BFE. The basement is exposed to flooding from any flood greater than the Base Flood.

Flood Risk by Foundation Type

Table 1 summarizes the foundation construction methods described in this bulletin and ranks them in order of increasing flood risk—the safest foundation types appear near the top; the less safe foundation types appear near the bottom. The foundation construction methods that result in a building that is reasonably safe from flooding are shown in the dark gray area of the table. If the basement construction methods shown in the light gray area are used, the requirements described in the following sections of this bulletin must be met in order for the building to be considered reasonably safe from flooding.

Table 1 Flood Risk by Foundation Construction Method



Basement Construction Guidance

For those who have chosen to accept the additional risk associated with basement construction below the Base Flood on filled land that has been removed from the SFHA, this bulletin provides technical guidance about measures that can be taken to protect basements and meet the requirement that buildings be made reasonably safe from flooding. A simplified approach, including the requirements that must be met for its use, is presented first. For buildings that do not meet the criteria for the simplified approach, this bulletin provides technical guidance for the development of an engineering design tailored to the site conditions.

Structural Design

Design of foundation elements is addressed in model building codes. This technical bulletin does not address the structural design of basement walls or foundations. Floors and slabs should be designed for the hydrostatic pressures that can occur from the Base Flood. For the structural design, it is recommended that the full hydrostatic pressures be assumed unrelieved by the drainage system. Foundation walls that have not been designed for hydrostatic pressures, such as unreinforced masonry or pressure-treated wood wall systems, should not be used (see Figure 9).

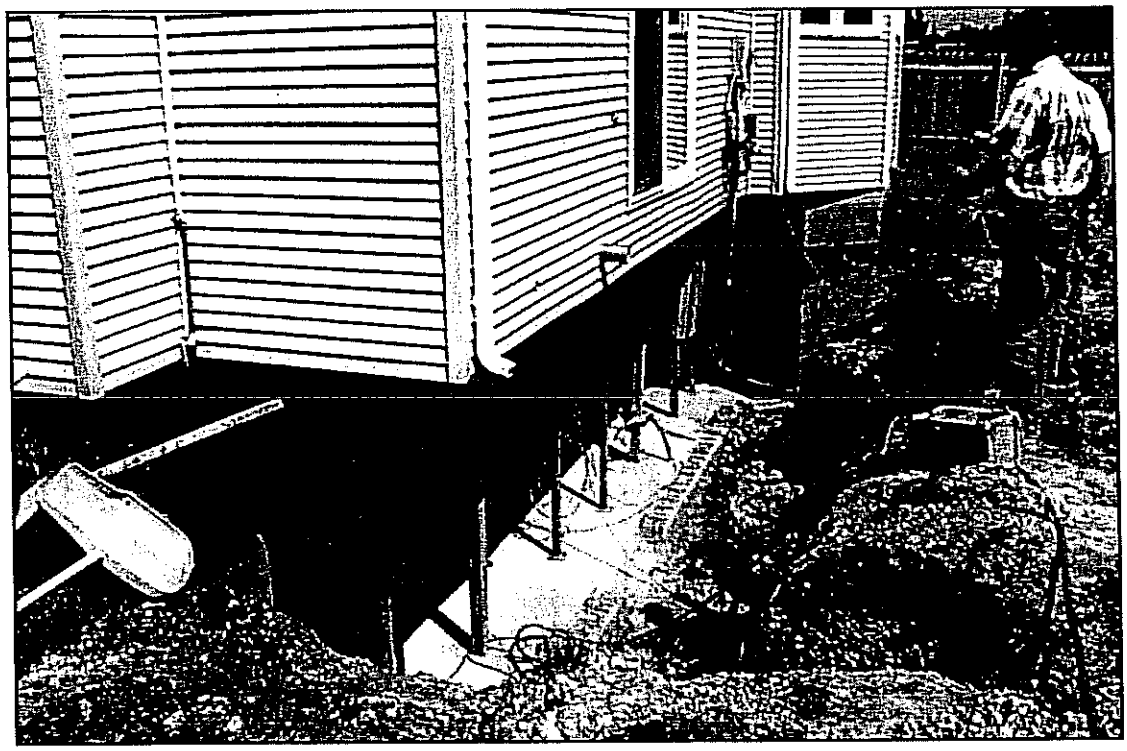


Figure 9 Failure of this unreinforced masonry basement during flooding in East Grand Forks, MN, in 1997 caused approximately $32,000 in damage.

Simplified Approach

Design Requirements

If, for a building and building site, **all** the requirements listed below are met (see Figure 10), the building is reasonably safe from flooding. If all of these requirements are not met, the more detailed analysis described under Engineered Basement Option, on page 19 of this bulletin, should be performed to determine whether the building is reasonably safe from flooding.

- ☐ The ground surface around the building and within a defined setback distance from the edge of the SFHA (see next item) must be at or above the BFE.
- ☐ The setback is the distance from the edge of the SFHA to the nearest wall of the basement. The minimum allowable setback distance is 20 feet.
- ☐ The ground around the building must be compacted fill; the fill material—or soil of similar classification and degree of permeability—must extend to at least 5 feet below the bottom of the basement floor slab.
- ☐ The fill material must be compacted to at least 95 percent of Standard Laboratory Maximum Dry Density (Standard Proctor), according to ASTM Standard D-698. Fill soils must be fine-grained soils of low permeability, such as those classified as CH, CL, SC, or ML according to ASTM Standard D-2487, *Classification of Soils for Engineering Purposes*. See Table 1804.2 in the 2000 *International Building Code* (IBC) for descriptions of these soil types.
- ☐ The fill material must be homogeneous and isotropic; that is, the soil must be all of one material, and the engineering properties must be the same in all directions.
- ☐ The elevation of the basement floor should be no more than 5 feet below the BFE.
- ☐ There must be a granular drainage layer beneath the floor slab, and a ¼-horsepower sump pump with a backup power supply must be provided to remove the seepage flow. The pump must be rated at four times the estimated seepage rate and must discharge above the BFE and away from the building. This arrangement is essential to prevent flooding of the basement or uplift of the floor under the effect of the seepage pressure.
- ☐ The drainage system must be equipped with a positive means of preventing backflow.
- ☐ Model building codes (such as the 2000 International Residential Code) also address foundation drainage (IRC Section R405) and foundation walls (IRC Section R404). Model building codes generally allow foundation drains to discharge through either mechanical means or gravity drains. In addition, there is often an exception to the requirement for drainage systems in well-drained soils. However, in or near floodplains, well-drained soils can, in fact, help convey groundwater towards the building foundation. Therefore, this exception should not apply in or near floodplains.

☐ In some cases in or near floodplains, even with standard drainage systems, hydrostatic pressures from groundwater against the basement can result. When a standard drainage system is unable to eliminate hydrostatic pressure on the foundation, model building codes, including the 2000 International Residential Code (IRC Section R404.1.3), require that the foundation be designed in accordance with accepted engineering practice. **The simplified approach contained in this Technical Bulletin assumes no hydrostatic pressure on the foundation and should be used only when a standard drainage system, discharged by a sump pump that is equipped with backup power and that discharges above BFE, is employed.** For other drainage systems, the designer should use the engineered basement option presented on page 19 of this bulletin and other appropriate building code requirements.

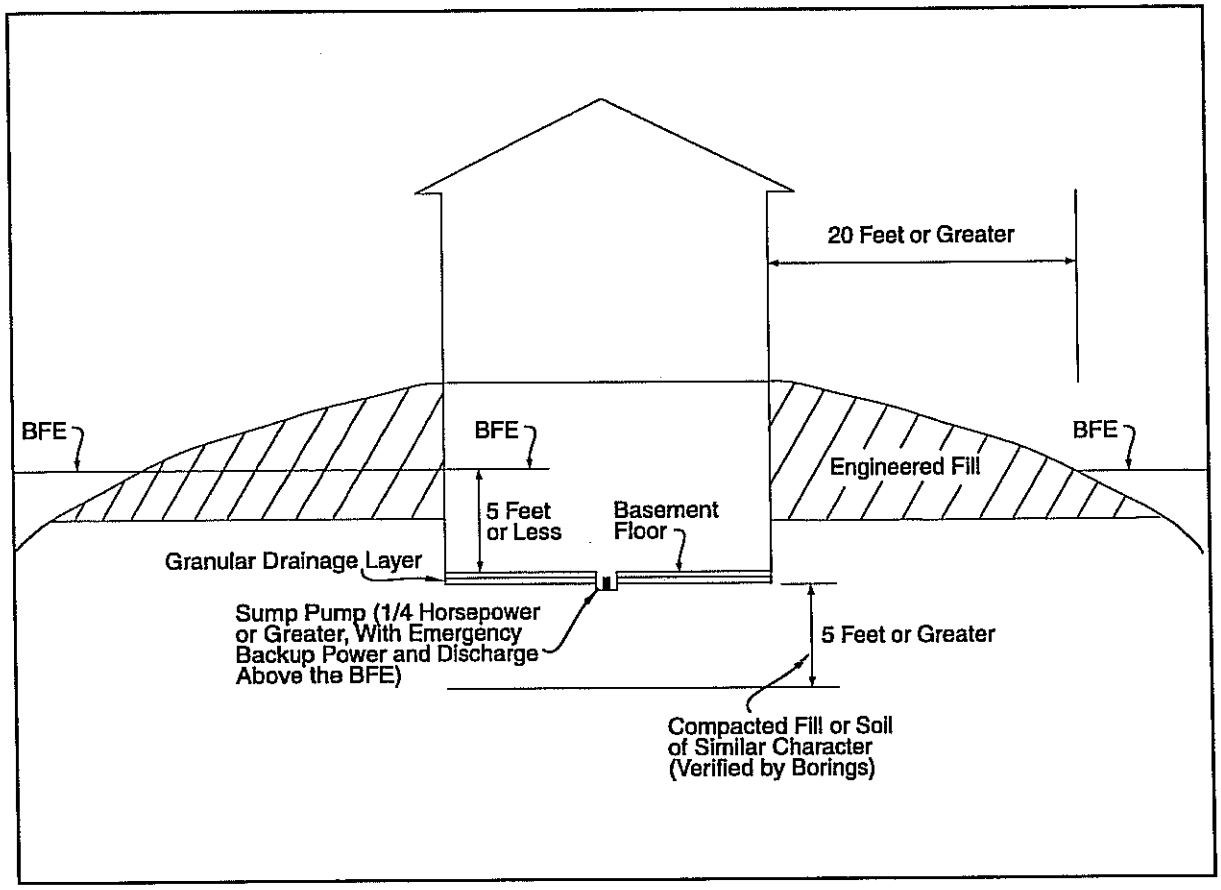


Figure 10 Requirements for use of the simplified approach to basement construction.

Technical Background for the Simplified Approach

The simplified approach is based on the following conditions:

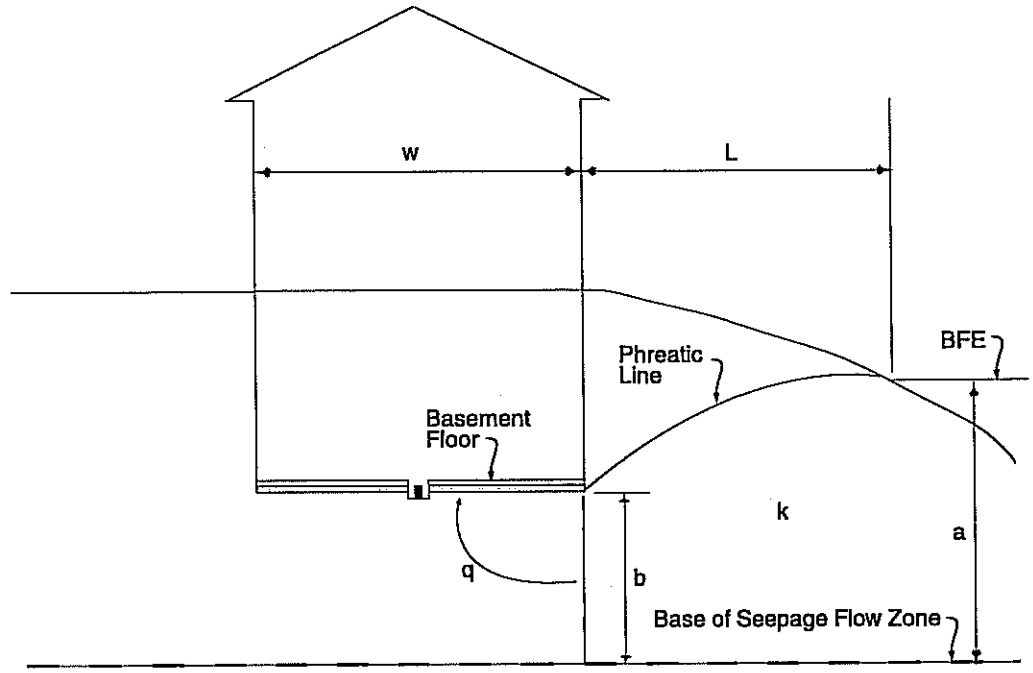
1. The area of the footprint of the basement is less than or equal to 1,200 square feet.

2. The soil is saturated; therefore, there is no time lag in the development of the seepage pattern with a change in flood water level. The groundwater table in floodplains is typically very shallow, and fine-grained soils have a substantial potential for maintaining saturation above the water table by capillary rise.

3. The tailwater level is at the elevation of the BFE. For this bulletin, "tailwater" is defined as the groundwater level beyond the structure, on the side away from the flood water surface. This is a reasonably conservative assumption because the flood would raise the groundwater level in the general area. In some cases, the tailwater level can be higher than the flood level because there is higher ground, as a valley wall, that feeds the groundwater into the floodplain soils.

4. The effective elevation of the base of the seepage flow zone can be defined (see Figure 11). This elevation is needed to permit calculation of the quantity of seepage flow. If the base elevation is not known, its depth below the base of the floor slab can be conservatively approximated as one-half of the building width most nearly perpendicular to the shoreline of the flood water. This would approximate the boundary effects of the three-dimensional seepage flow, in that it would represent the flow coming in from all sides and meeting in the center beneath the floor slab. This approach assumes a constant soil type and density over the flow zone. If the site has stratified soil layers, the engineered basement option should be used (see page 19 of this bulletin).

5. The quantity of seepage flow can be calculated by a simplified method based on Dupuit's assumption that equipotential lines are vertical. (The Dupuit method uses Darcy's law with specific physical characteristics. A more detailed description can be found in the first two references listed under "Further Information," on page 23 of this bulletin.) The elements of the method are presented in Figure 11. The entry surface, with hydraulic head "a," is a vertical line extending downward from the edge of the flood surface. The exit surface, with hydraulic head "b," is a vertical line extending downward from the side of the structure closest to the flood water's edge. The length of the flow path, "L," is the setback distance. Flow is assumed to be horizontal, and the horizontal coefficient of permeability is the effective permeability. For simplicity, the small inclined entry zone at the river bank and the exit zone below the basement floor are ignored. This is a reasonably conservative measure. The phreatic line, or the line below which the seepage flow occurs under positive pressure, extends from the edge of the flood water to the elevation of the bottom of the basement floor slab. If the exit zone below the basement floor were included, the hydraulic head at "b" would be higher. As shown in Figure 11, the phreatic line is not a straight line, but within the limits of the assumed boundary values, it is close to a straight line.



(1) $q = k(a^2 - b^2)/2L$

where: q = flow in cfs for a 1-foot width of seepage zone
k = soil permeability in feet per second
a = head at entry surface in feet
b = head at drain surface in feet
L = length of seepage zone (setback distance) in feet

(2) $Q = Pq$

where: Q = total seepage flow into drain in cfs
P = 2(basement length + width)
(for a square basement, P = 4w)

(3) Required sump pump capacity = 4Q for a safety factor of 4

Figure 11 Method for calculation of seepage flow.

The Dupuit equation for the quantity of seepage flow is:

$$q = k(a^2 - b^2)/2L$$

where: q is the flow in cubic feet per second for a 1-foot width of seepage zone

k is the soil permeability in feet per second (fps) (maximum value of k is 1×10^{-3} fps)

a and b are hydraulic heads in feet ($a < b + 5$)

L is the length of the flow zone in feet ($L > 20$ feet)

To obtain Q, the total seepage flow, in cubic feet per second, q must be multiplied by the length around the periphery of the four sides of the structure. This is a simplifying approach that obviates the need for a three-dimensional flow net calculation and is reasonably conservative.

It should be noted that the soil permeability does not affect the geometry of the seepage zone or the geometry of the phreatic line. The permeability does have a significant effect on the quantity of seepage that must be collected and discharged by the drainage layer and the sump pump. The calculation of the quantity Q provides a basis for the selection of a sump pump of adequate capacity. To allow for possible errors in the estimation of the soil permeability, the pump should have a capacity of at least four times the calculated value of Q. As noted in the requirements section, a standard sump pump of ¼ horsepower or greater will generally satisfy the requirements of seepage removal for the conditions described above.

Engineered Basement Option

If the requirements specified for the simplified approach are not met, a licensed soils engineer or geologist should perform a detailed engineering analysis to determine whether the structure will be reasonably safe from flooding. The analysis should consider, but is not limited to, the issues described in the following sections.

Depth, Soil Type, and Stratification of Subsurface Soils

The depth, soil type, and stratification of the subsurface soils may be complex. Four potential generalized scenarios are shown in Figures 12 and 13. Figure 12 shows two cases of homogeneous soil. The depth of penetration of the basement and the depth of the flow zone are not limited to the assumptions on which the simplified approach is based. Case I represents a foundation consisting of clayey soils, either fill or natural deposits or a combination, which are more or less homogeneous because they have similar engineering properties. If an adequate setback distance is provided, the seepage quantity would be relatively low, and uplift pressure beneath the slab could be controlled by an appropriately sized sump pump because of low permeability.

Case II represents a foundation consisting of sandy soils, either fill or natural soil deposits or a combination, which are more or less homogeneous because they have similar engineering properties. The seepage quantity would be fairly large, and more attention would have to be given to the setback distance and to the provision of an adequately sized sump pump to prevent excessive uplift pressure beneath the floor slab because of high permeability.

Figure 13 shows two simple cases of stratified soils, with impervious clays overlying pervious sands. This is a common occurrence in natural floodplain deposits. In Case III, the contact between the two soil strata is at some distance **below** the basement floor. This case would involve a moderate quantity of seepage, depending on the thickness, d, of the impervious stratum below the basement floor. There is also a potential for excessive uplift pressure beneath the floor, at the level of the bottom of the clay stratum. If d is equal to h, the net hydraulic head between the flood level and the floor level, the safety factor against uplift would be approximately 1.0. If d is less than h, there would be excessive uplift, with a safety factor equal to less than 1.0.

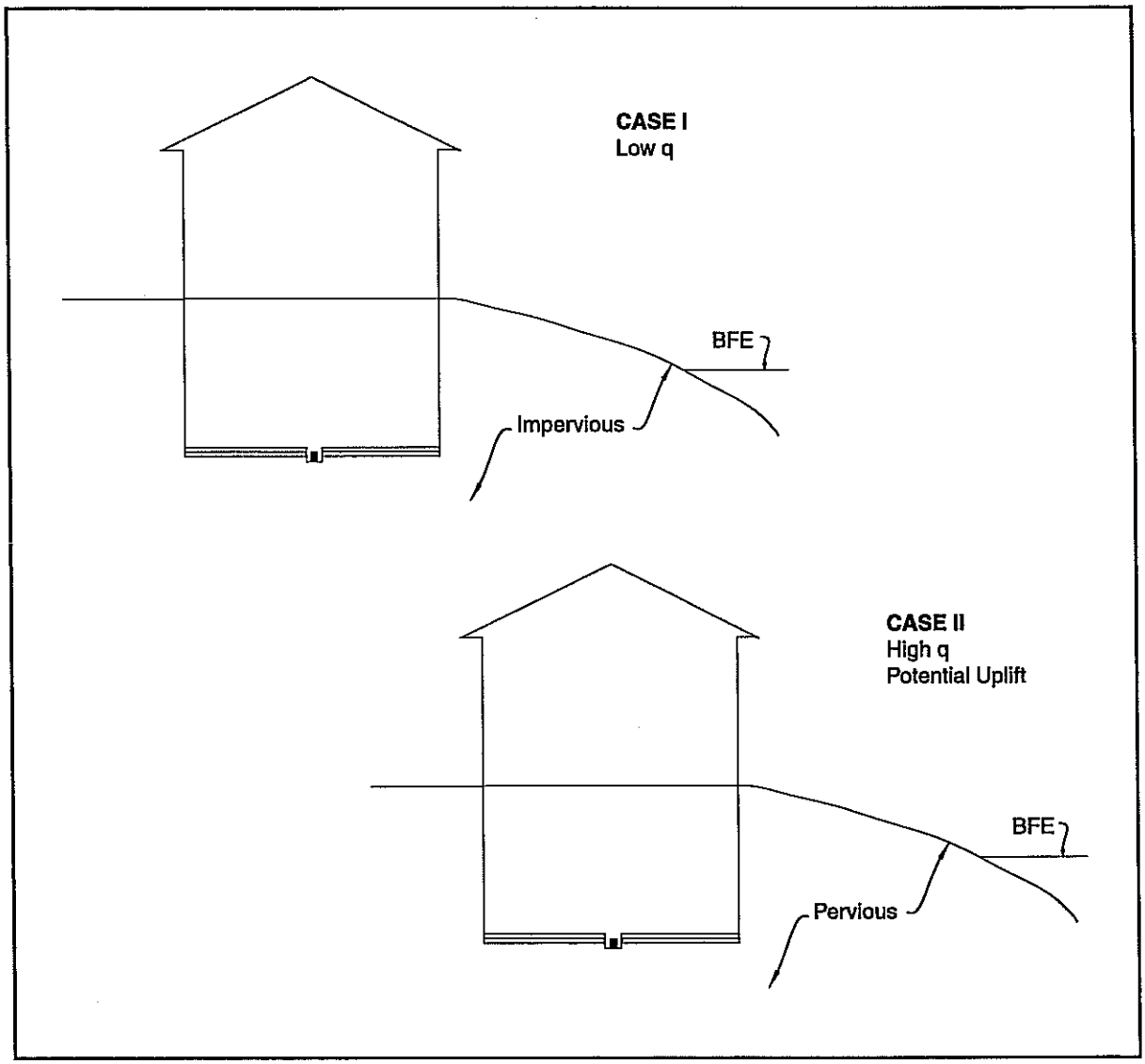


Figure 12 Case I and Case II – homogeneous soil.

Case IV shows impervious soils overlying pervious soils, with the contact between the soil strata at some distance **above** the basement floor. This case would involve a large quantity of seepage and potential for excessive uplift beneath the basement floor.

Geotechnical Investigations

Geotechnical investigations must be made for cases that do not conform with the assumptions on which the simplified approach is based. Information that is needed to permit an adequate engineering analysis includes the following:

- The BFE, which is to be used as the design flood water surface for calculating expected seepage.

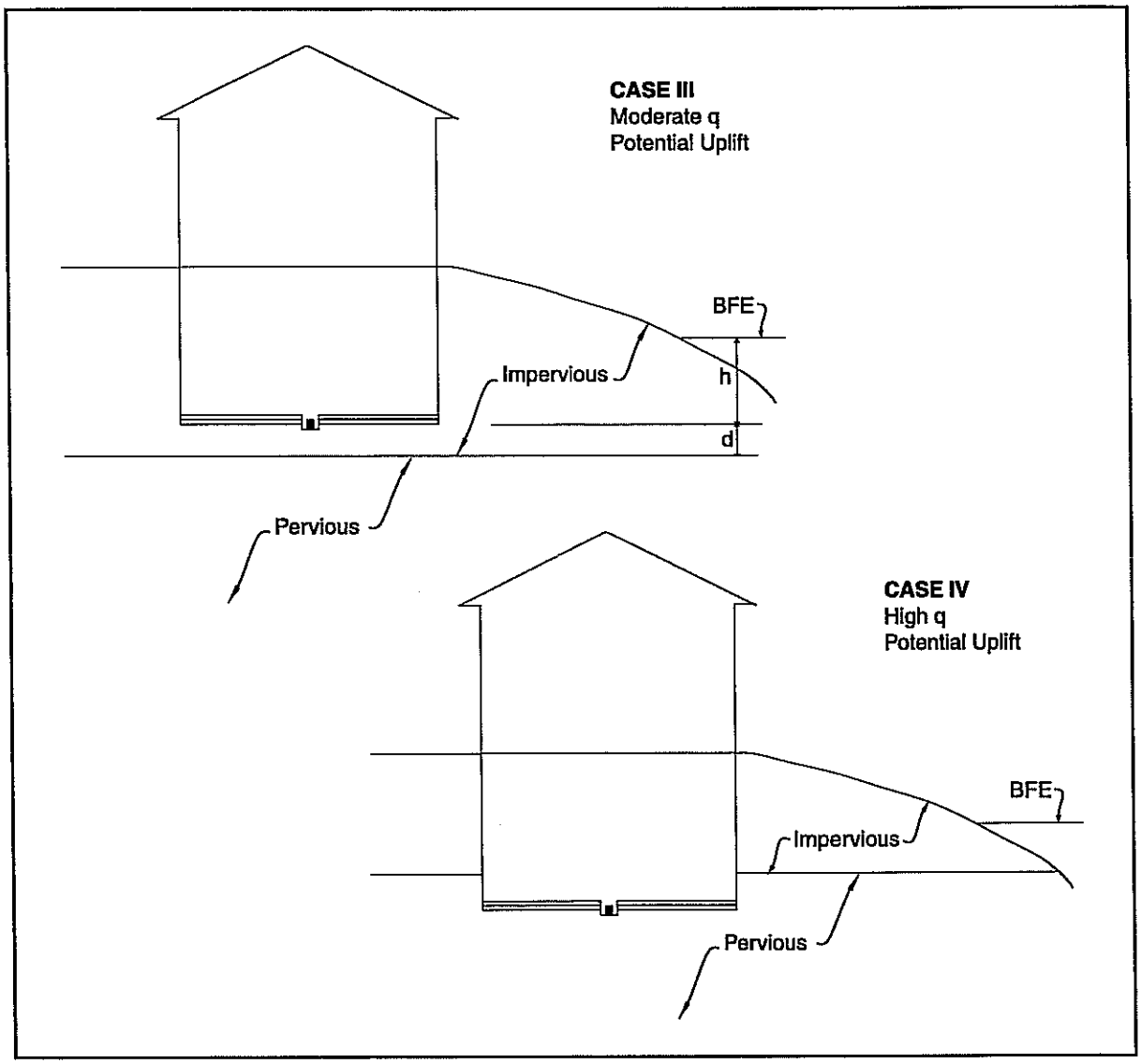


Figure 13 Case III and Case IV – stratified soils.

- The elevation of the **bottom** of the basement floor. This can be adjusted as needed to achieve more suitable conditions.
- The setback distance of the basement wall from the edge of the flood water. This can be adjusted to achieve more suitable seepage control or to accommodate available space restraints.
- The elevation of the groundwater table and its seasonal variations. A high water table would cause problems with groundwater control during construction of a basement, even without a flood event.
- The stratification of the subsurface materials, for both natural and fill soils. In general, borings should be drilled to a depth below the bottom of the floor slab that is at least two times as great as the depth of the bottom of the floor slab below the BFE.

- The engineering classification of the soils, for both natural and fill soils. This must be done in accordance with ASTM D2487, *Classification of Soils for Engineering Purposes*. This is the Unified Soil Classification System that is universally used throughout the United States. Local or county agricultural soil survey maps should not be used, because they do not give specific information about location and depth of soils, and their designations are not pertinent to civil engineering use.
- Subsurface conditions landward from the structure. This includes information about the location of the water table, whether it is higher or lower than the flood level, and information about any penetrations of the soil, such as ponds. Attention should be given to the possibility that higher ground, such as valley walls, could contribute to the groundwater level in the floodplain, either perennially or during periods of heavy rain.
- Information about any penetrations through the basement walls below the BFE, such as utility lines and other openings.
- Analysis of seepage quantity. The analysis can be made by the conservative simplified method described in Item 5 in the section titled Technical Background for the Simplified Approach (illustrated in Figure 11), or by the construction of a flow net that takes into account all of the boundary conditions more rigorously. A flow net may be required to permit analysis of uplift pressures. Uplift pressures may be more significant in laminated or stratified soil deposits.

Buildings in Existing Filled Areas

In evaluating buildings in existing filled areas, the two approaches already described—the simplified approach or the engineered basement option—can be used. If the simplified approach is used, all the requirements for the use of this approach must be met. Some possible means for evaluating whether these requirements are met include soil tests and investigations, including soil borings and hand augers; field records from the time the fill was placed; and soil surveys. If the requirements for the simplified approach are not met, a licensed soils engineer or geologist should perform a more detailed engineering analysis as described under Engineered Basement Option on page 19. More extensive soil investigations and testing may be required to complete the analysis.

The NFIP

The NFIP was created by Congress in 1968 to provide federally backed flood insurance coverage, because flood coverage was generally unavailable from private insurance companies. The NFIP is also intended to reduce future flood losses by identifying floodprone areas and ensuring that new development in these areas is adequately protected from flood damage. The NFIP is based on an agreement between the Federal government and participating communities that have been identified as floodprone. FEMA, through the Federal Insurance Administration (FIA), makes flood insurance available to the residents of a participating community, provided the community adopts and enforces adequate floodplain management regulations that meet the minimum NFIP requirements. The NFIP encourages communities to adopt floodplain management ordinances that exceed the minimum NFIP criteria set forth in Part 60 of the NFIP Floodplain Management Regulations (44 CFR 60). Included in the NFIP requirements, found under Title 44 of the U.S. Code of Federal Regulations, are minimum building design and construction standards for buildings located in SFHAs. Through their floodplain management

ordinances or laws, communities adopt the NFIP performance standards for new, substantially improved, and substantially damaged buildings in floodprone areas identified on FEMA's FIRMs.

Technical Bulletins

This publication is one of a series of Technical Bulletins that FEMA has produced to provide guidance concerning the building performance standards of the NFIP. These standards are contained in 44 CFR 60.3. The bulletins are intended for use primarily by state and local officials responsible for interpreting and enforcing NFIP regulations and by members of the development community, such as design professionals and builders. New bulletins, as well as updates of existing bulletins, are issued periodically, as necessary. The bulletins do not create regulations; rather they provide specific guidance for conforming with the minimum requirements of existing NFIP regulations. Users of the Technical Bulletins who need additional guidance concerning NFIP regulatory requirements should contact the Mitigation Division of the appropriate FEMA regional office or the local floodplain administrator. NFIP Technical Bulletin 0, the *User's Guide to Technical Bulletins,* lists the bulletins issued to date, provides a key word/subject index for the entire series, and lists addresses and telephone numbers for FEMA's 10 Regional Offices.

Ordering Information

Copies of FEMA Technical Bulletins can be obtained from the FEMA Regional Office that serves your area. In addition, Technical Bulletins and other FEMA publications can be ordered from the FEMA Publications Distribution Facility at 1-800-480-2520. The Technical Bulletins are also available at the FEMA web site at www.fema.gov.

Further Information

The following publications contain information related to the guidance presented in this bulletin:

American Society of Civil Engineers. 1998. SEI/ASCE 24-98, *Flood Resistant Design and Construction.*

Cedergren, H. R. 1977. *Seepage, Drainage and Flow Nets.* Wiley. New York.

Harr, M. E. 1977. *Mechanics of Particulate Media.* McGraw Hill. New York.

International Code Council. 2000. *International Building Code.* Birmingham, AL.

International Code Council. 2000. *International Residential Code.* Birmingham, AL.

U.S. Department of the Army, Corps of Engineers. 1986. EM 1110-2-1901, *Seepage Analysis and Control for Dams.* Washington, DC.

U.S. Department of the Army, Corps of Engineers. 1978. EM 1110-2-1913, *Design and Construction of Levees.* Washington, DC.

Glossary

Base Flood – The flood that has a 1-percent probability of being equaled or exceeded in any given year (also referred to as the 100-year flood).

Basement – Any area of a building having its floor subgrade (below ground level) on all sides.

Community – Any state or area or political subdivision thereof, or any Indian tribe or authorized tribal organization, or Alaska Native village or authorized native organization, which has the authority to adopt and enforce floodplain management regulations for the areas within its jurisdiction.

Federal Emergency Management Agency (FEMA) – The independent Federal agency that, in addition to carrying out other activities, administers the NFIP.

Federal Insurance Administration (FIA) – The component of FEMA directly responsible for administering the flood insurance aspects of the NFIP.

Flood Insurance Rate Map (FIRM) – The insurance and floodplain management map issued by FEMA that identifies, on the basis of detailed or approximate analysis, areas of 100-year flood hazard in a community.

Floodprone area – Any land area susceptible to being inundated by flood water from any source.

Mitigation Directorate – The component of FEMA directly responsible for administering the flood hazard identification and floodplain management aspects of the NFIP.

New construction/structure – For floodplain management purposes, new construction means structures for which the start of construction commences on or after the effective date of a floodplain management regulation adopted by a community and includes subsequent improvements to the structure. For flood insurance purposes, these structures are often referred to as "post-FIRM" structures.

Special Flood Hazard Area (SFHA) – Area subject to inundation by the base flood, designated Zone A, A1-30, AE, AH, AO, V, V1-V30, or VE.

BURLEIGH COUNTY Water Resource DISTRICT

Burleigh County Water Resource District

City/County Office Building - 221 North 5th Street
Bismarck, North Dakota 58501-4028

FLOODPLAIN ORDINANCE POSITION STATEMENT
BISMARCK PLANNING AND ZONING COMMISSION – JUNE 23, 2010

INTRODUCTION:

The Burleigh County Water Resource District supports the proposed revisions to the City's Floodplain Ordinance; however, one serious issue remains unresolved that in our opinion requires reconsideration and additional changes to the ordinance. The proposed ordinance continues to allow the construction of basement (i.e., lowest) floors below the floodplain elevation on properties that have been removed from the floodplain or Special Flood Hazard Area (SPHA) through a Letter of Map Revision (LOMR). We strongly encourage and recommend you reconsider and not allow finished floor elevations, basements or crawl spaces to be constructed in these areas. To support this position we offer the following background and justification:

1. The Corps of Engineers in their *Oahe- Bismarck Area Studies, Analysis of Missouri River Flood Potential in the Bismarck, North Dakota Area, August 1985* - stated the following:

   > *"... the City of Bismarck, Burleigh County, and those developing in the flood plain should also consider additional flood plain management measures in the form of raising new development more than the 1 foot above the potential existing-conditions 100-year flood elevation and raising access roads to area of extensive development. These floodplain management measures would reduce future flood damages and provide greater safety to persons living in the floodplain. Also those persons living or having businesses in the flood plain should continue to take advantage of the Federal Flood Insurance Program to minimize flood damage losses."*

   The Corps of Engineers report documented that the Oahe Delta Formation would result in increased Base Flood Elevations (BFE's or the 100-year event) along the Missouri River into the future. Nearly 25 years later, as a community, we are just now getting around to implementing these recommendations. Historically only the minimum National Flood Insurance Program (NFIP) or the State of North Dakota standards were implemented and enforced. This has resulted in many residences being constructed within the Missouri River floodplain and in LOMR areas that are subjected to a higher level of flood risk.

2. The *Bismarck/Burleigh County Flood Insurance Study*, effective September 1985, documented Base Flood Elevations, and the floodplain/floodway boundaries on Flood Insurance Rate Maps (FIRM's) for the Missouri River and other streams in Burleigh County. Subsequently, the Federal Emergency Management Agency (FEMA) published a revised DFIRM in 2005, which incorporated documented increases in the BFE's of up to one foot in some areas. These increased flood elevations are associated with changes that occurred in river conveyance capacity during the 20 year span between FIS Reports. Unfortunately these increases have already reached those projected by the COE in their August 1985 report. As these increases continue new residences constructed to minimum standards will at some point in their life span be subjected to increased flood risks, so we need to protect them now by not allowing avoidable risks.

   As a point of interest, approximately 17 years passed between the topographic data sets used to create the FIS Report and FIRM's. Another 9 years has passed and significant silt accumulation has occurred south of the Heart River associated with the March 2009 ice jam event. At this point we do not know what affect this has had on the BFE's.

EXHIBIT B

3. FEMA does not have authority under the National Flood Insurance Program (NFIP) to restrict basement (i.e., lowest) floors elevations being constructed below the floodplain elevation on properties which have been removed from the floodplain through the Letter of Map Revision (LOMR) process. This is not for a lack of trying; they simply have been unable to press required regulatory changes through congress. Subsequently, FEMA prepared a document entitled "*Ensuring That Structures Built In or Near Special Flood Hazard Area Are Reasonably Safe From Flooding*", typically referred to as *Technical Bulletin 10-01*, to address increased risks associated with development placed in areas removed from or adjacent to the floodplain.

   Page 9 of Technical Bulletin 10-10 states the following:

   "Basement Foundations

   Although basements are a desired feature in some areas of the United States, NFIP minimum requirements generally do not allow their construction in the SFHA, because of the increased risk of flood damages. The only instances where this is not the case, are buildings for which FEMA has granted a special exemption to allow floodproofed basements. However, once land is removed from the SFHA through a map revision {e.g., LOMR}, these NFIP minimum requirements no longer apply. As a result, builders and property owners who build on land removed from the SFHA sometimes elect to install basements, which are at a higher risk of flood damage than the foundation types described previously. Constructing a basement on such land is **not** *recommended, because the basement (i.e., lowest) floor and portions of the basement walls may well be subjected to subsurface flooding. The basement may therefore be subject to seepage and lateral hydrostatic and uplift pressure caused by high groundwater levels associated with flooding in surrounding areas. Additionally, when flooding exceeds the BFE, the basement area may be totally inundated with floodwater. When builders and homeowners decide to accept the additional risk associated with basement construction on filled land, they need to ensure that the basement and the rest of the house are reasonably safe from flooding." {**Underline Emphasis – The bolding of the word "not" is a direct quote.**}*

Letters of Map Revision are intended to remove properties from the floodplain as such action reduces the potential risk for flood damages associated with structures constructed on these elevated properties. While not specifically intended to allow landowners to avoid the cost of flood insurance, in many cases that has become the net objective, unfortunately along with the ability to construct basement (i.e., lowest) floors below the floodplain. Again upon removal a parcel from the floodplain the property is no longer subject to NFIP criteria or in this case the City's floodplain ordinance. Therefore, in the case of a LOMR the requirement to place the basement (i.e., lowest) floors a residence two feet above the BFE no longer applies. While the City may have other means to require finished floor elevations to be elevated that authority is not contained in this ordinance and it should be as this is a floodplain issue.

CONCLUSIONS:

The decision and question before the Planning Commission this evening is clear. What level of "public risk" are you willing to accept on behalf of the Community and residents that purchase these properties? What is this "public risk"? When a flood disaster occurs, and it will occur, the public through disaster declarations ends up footing a portion of the expenses related to flood damages and recovery. The Burleigh County Water Resource District documented flood damages over $1 million in the rural residential area of Fox Island from the March 2009 flood, which was not a 100 year event. This breaks down to around $767,000 to the primary residences and $239,000 to garages and outbuildings. Approximately $395,000 was covered by insurance reimbursements and $13,050 via FEMA disaster assistance. The proposed ordinance addresses the need to elevate garages and outbuildings which is very important, however, once the property is removed from the floodplain the ordinance no longer applies and these structures no longer need to be elevated as required by the ordinance.

Residential structures removed from the floodplain through the LOMR process are not required to carry flood insurance. Therefore, allowing basement (i.e., lowest) floors to be constructed on properties increases the potential for flood damages, and since they are not required to have flood insurance the public risk and potential cost burden is increased. The impacts suffered on Fox Island are culminated from the use of three sets of minimum standards, the pre 1985 FIS mapping, the 1985 FIRM and the current 2005 FIRM. As a community do we want to continue to insure the risks associated with the construction of basement (i.e., lowest) floors below the BFE? The answer for us is no.

It is important to recognize the Corps of Engineers has no project authority to address the Oahe Delta formation and its impacts; therefore we fully anticipate and expect floodplain elevations to continue to increase. If we do not prepare for this inevitable occurrence, by regulating development on property within as well as removed from the floodplain, we will be allowing new residences to be constructed and assuming what to us is an unacceptable public risk. In addition, it is important to protect those who purchase these residences and are typically uninformed regarding the risks associated with properties constructed in or near a floodplain.

RECOMMENDATIONS:

1. The prudent and most effective step is to not allow basement (i.e., lowest) floors to be constructed on properties removed from the floodplain through the LOMR process. We are willing to work with Community Development to revise the ordinance language to specifically address our concerns. While we previously submitted suggested language, it was not included in the current draft before you today. Understand again the intent of a LOMR is to raise a parcel above the floodplain, thus reducing the potential flood damage risks to new structures. Subsequently, allowing basement (i.e., lowest) floors to be constructed below the floodplain elevation, after the property is removed from the floodplain, is in direct conflict with the purpose and value of a LOMR. If you agree to reconsider this issue we request that you table action on this ordinance while possible revised language is developed.

2. A much less desirable alternative is to implement a requirement within the ordinance that requires all structures constructed within areas removed from the floodplain to comply with Technical Bulletin 10-01. Developers along the Missouri River have taken it upon themselves not to construct deep basements, as they understand the risks; however they still place basement floors below the floodplain elevation. The proposed ordinance language before you does not restrict that from occurring, therefore, these structures continue to be placed at higher risk. As our Board is responsible for overseeing water resources and promoting flood prevention; we are obligated to inform you that allowing basement (i.e., lowest) floors below the floodplain is an unacceptable practice and is **not** recommended by FEMA. In this instance we again would request you table action to consider implementation of the criteria outlined in Technical Bulletin 10-01, as it should not be incorporated without adequate time to review its content and implications.